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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 09/656,325
Filing Date: September 06, 2000
Appellant(s): NELSON ET AL.

Michael A. Oblon
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 05/29/2008 and 10/06/2008 (supplemental) appealing from the Office action mailed 10/30/2007.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5,894,103

SHANN

4-1999

6,584,907

BOUCHER

7-2003

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

DETAILED ACTION

Brief Discussion of US 6584907 issued to Boucher et al. (hereinafter "Boucher")

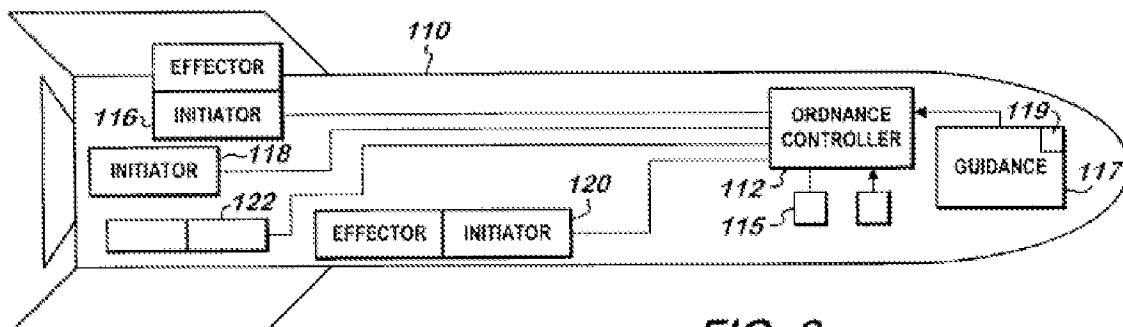


FIG. 6
(PRIOR ART)

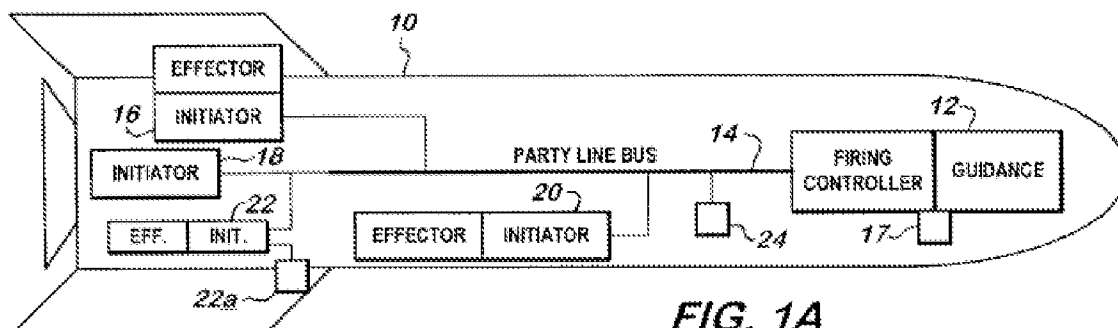


FIG. 1A

Generally, Boucher is directed to an Ordnance Firing System that utilizes a single party bus line 14 provide communication between a firing control system 12 and a plurality of

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initiators 16, 18, 20, 22. A partial description of the ordnance system above can be found at column 6, lines 58-64 of the specification as follows:

FIG. 1A provides a schematic illustration of a missile 10 equipped with an ordnance firing system in accordance with
60 the present invention. The ordnance firing system comprises a firing control system 12, a communication bus 14, and a plurality of initiators 16, 18, 20, 22 for reactive effectors on the device. The initiators are connected to the bus 14 and a remote sensor 24 is also connected to bus 14.

Boucher goes on to further describe the features of the “intelligent initiators” which include an *address code* that allows the firing control system 12 to communicate with any one or all of the initiators 16, 18, 20 and 22. The *address code* allows the firing control system to *talk* to a specific initiator in spite of the fact that only a single party bus line is used. Additionally, the initiators 16, 18, 20 and 22 may *talk* to the firing control system using the same code. The relevant portion of the specification describing these features can be found at column 9, line 36 to column 10, line 17 as follows:

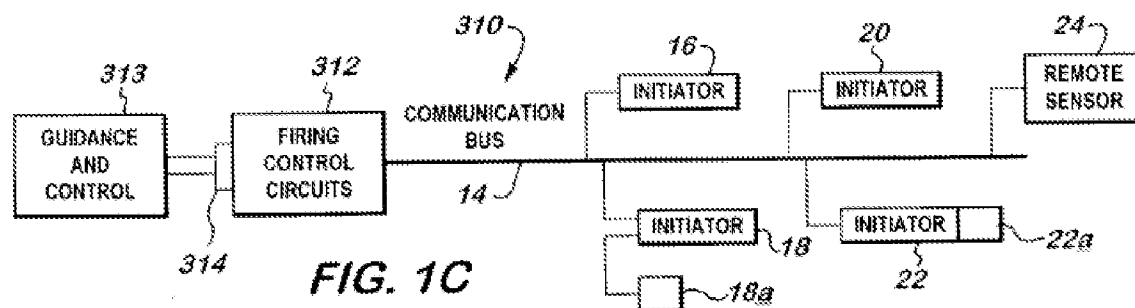
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Referring again to FIG. 1A, another feature of the ord-
nance firing system of this invention is the use of a multi-line
party bus for establishing communication between the firing
control system circuitry and the various initiators. This
feature provides advantages irrespective of whether an ini- 40
tiation system employs planar, low-energy initiators and a
low-energy power source. According to this feature, initia-
tors 16, 18, 20 and 22 each contain communication circuitry
for receiving and evaluating signals received via communi-
cation bus 14 from firing control system 12 or, optionally, at 45
least one remote sensor 24. Since all of the initiators are
connected to the same communication bus 14, they all
receive each of the signals issued by firing control system
12. However, in accordance with the present invention,
initiators 16, 18, etc., contain initiator firing circuits that are 50
programmed to recognize an address portion of signals
received on communication bus 14. The initiator firing
circuit is programmed only to respond to those signals that
contain an address code identified with that initiator. The
address code may constitute a specific address unique in the 55
system to that initiator; it may be a "shared" address also
recognized by some other initiators in the system but not all
of them, or it may be a "universal" address which all
initiators connected to bus 14 recognize. Firing control
system 12 and remote sensor 24 are configured to emit 60
signals that contain the appropriate address codes so that the
signals will be recognized and acted upon by the appropriate
initiators. As a result of the use of coded signals, initiators
16, 18, etc., may be connected to shared wires in commu-
nication bus 14 and bus 14 may therefore comprise merely 65
two or three communication wires. A four-wire bus might be
used as well, to provide separate wires for arming power,

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operation power, communication and ground. Similarly, initiators 16, 18, etc., may optionally be configured to generate and emit initiator signals onto communication bus 14. Firing control system 12 may be designed to receive and interpret initiator signals received via bus 14. The signal emitted by an initiator may contain an identifier code that is unique to the issuing initiator so that the firing control system can distinguish among signals from the various initiators. Accordingly, one feature of the present invention is that firing control system 12 and initiators 16, 18, etc., are configured for two-way communication along bus 14. This feature of the invention allows for an ordnance firing system in which initiators can provide feedback to the control unit along the bus. The ordnance firing system can be configured so that, prior to a firing sequence, the firing control system unit issues a query signal to one or more initiators and the initiators respond to indicate their readiness to function.

Boucher goes on to further describe a feature important to this appeal: the ability of the initiators to provide control over the firing process of the ordnance firing system through the use of sensors to detect external and internal conditions. A general discussion of these features begins at column 11, line 38 but the more relevant portion of the disclosure begins at column 12, line 31 which describes internal sensor 22a which is attached to the initiator as shown below.



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indicates favorable conditions. Similarly, initiator 22 is responsive not only to signals from firing control system 12 but also to an internal sensor 22a which may sense conditions inside the initiator shell. Such internal conditions may include the condition of the firing circuitry of initiator 22, the condition of the output charge of initiator 22, etc. Other relevant internal conditions that might be reported by sensor 22a include temperature, voltages, frequencies, current draw, initiation element continuity, etc. If a firing signal is received from firing control system 12 but the requisite signal is not received from the sensor 22a, initiator 22 may optionally be programmed to postpone firing despite the firing signal from firing control system 12. Sensor 22a may thus provide a built-in test function for manufacturing quality as well as field reliability.

The internal sensor detects conditions such as *voltages, frequencies and current draw* and acts as a condition precedent to the firing of the device. As will be discussed later, this receipt of internal information and the decision process that follows can be performed prior to receipt of either the arming or firing signal.

In one embodiment of the invention, Boucher discloses "time-phased arming" in which the firing capacitor is armed through a series of arming signals sent to the initiators. However, this is only one optional means by which the firing capacitor is armed (charged).

In the embodiment of Figure 5, Boucher discloses an initiator 16c connected to party line bus 14 which is ultimately connected to a firing controller 12 as described above. The initiator includes several components but some of the more important ones are the data communication circuit 52, initiator control circuit 54, internal sensor 56, arming switch 28 and energy storage capacitor 26. Discussion of the embodiment of Figure 5 begins at column 15, line 46 as follows:

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There is shown in FIG. 5 an initiator 16c in accordance with a specific embodiment of the present invention. Initiator 16c is joined to a party line bus 14. Signals received from the firing control system via bus 14 pass through several buffer devices including common mode EMI (electromagnetic interference) filter 44, high impedance isolators 46 and over-voltage clamp 48. EMI filter 44 provides protection against susceptibility to random electromagnetic signals that may be inadvertently conveyed along bus 14. Impedance isolators 46 limit the energy that can be received from bus 14 for use by the remainder of the initiator circuit.

A signal that meets the requirements of the buffer provided by EMI filter 44, isolators 46 and clamp 48 is then conveyed to arming switch 28, power supply circuit 50 and data communication circuit 52. An initiator control circuit 54 receives input from data communication circuit 52 and power supply 50 as well as status information from energy storage (e.g., capacitor) 26 and the initiation element, e.g., semiconductor bridge 42a. When the proper input signals are received from these sources, initiator control circuit 54 may issue an arming signal. In the illustrated embodiment,

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the arming signal is received by a logic gate 54a which also receives input from an internal sensor 56. If the output of internal sensor 56 is appropriate for the operation of arming switch 28, logic gate 54a may convey the control arming signal from control circuit 54 to arming switch 28, through which a charging voltage may be applied to the energy storage device, i.e., a firing capacitor 26. Optionally, charging may occur in a set fashion as described in connection with FIGS. 2 and 3. When the initiating element is a semiconductor bridge, the energy requirement for initiation is substantially smaller than in prior art devices, so firing capacitor 26, which may typically be sized to release only 5 millijoules, may be employed for a 1-ohm SCB, obviating the need for a battery as would be required by prior art devices. When appropriate signals are received, control circuit 54 may issue a control firing signal for firing switch 58. In the illustrated embodiment, an optional logic gate 54b compares the control firing signal to the output of an environmental sensor 18a and only conveys the control firing signal to the firing switch when the environmental sensor 18a indicates that conditions are appropriate for firing. The closure of firing switch 58 permits the discharge of firing capacitor 26 through the semiconductor bridge 42a or other initiation element, thus initiating the device.

In addition to providing input to logic gates 54a and 54b, internal sensor 56 and external sensor 18a may provide signals directly to initiator control circuit 54 and/or data communication circuit 52 so that initiator 16c can perform a self-test for readiness prior to the receipt of an arming or firing signal from party line bus 14. Optionally, the self test can be performed in response to a query signal received from bus 14 and the results may be reported in a response signal emitted along bus 14.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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2. Claim 91 is rejected under 35 U.S.C. 103(a) as being unpatentable over the embodiment of Fig. 5 of US 6584907 issued to Boucher in view of the embodiment of Fig. 1A. The embodiment of Fig. 5 discloses a networked electronic ordnance system, comprising:

- a. a bus controller 12
 - the bus controller 12 provides digital arming and firing commands to pyrotechnic devices via network 14, each command is in *address* form and includes a code (unique identifier). Refer back to a discussion of the addressing scheme starting at pg. 9, line 46 of the specification.
 - the bus controller works in conjunction with power source 17 to arm a capacitor in the pyrotechnic device.
- b. a plurality of pyrotechnic devices 16, 18, 20, 22 connected to network 14 by bus controller 12, the pyrotechnic device 16c, comprising:
 - i. a bus interface 56:
 - element 56 is disclosed as being an internal sensor.
 - in a general discussion of the operation of the ordnance device, the specification disclosed internal sensors (22a) as being capable of sensing conditions such as *voltages*, *frequencies* and *current draw*, this qualifying element 56 as a bus interface.
 - while the examiner used the applicant's admission that bus interfaces were well known in the art, it has been determined

that this admission is no longer necessary because the internal sensor performs the claimed functions.

- ii. an energy storage capacitor 26;
- iii. an initiator 42a;
- iv. a logic device 54
 - as disclosed by the specification, each initiator is “programmed” with an address code (col. 9, ll. 52-56).
 - according to the embodiment of Fig. 5, if conditions are proper, logic device 54 will issue an arming (charging) signal that “stores activation energy in the capacitor” as claimed by the applicant. (Col. 15, ll. 65-67).
 - the decision to fire is based on conditions precedent: 1) a properly coded firing signal from the bus controller (col. 16, ll. 15-17, “appropriate signals” refers in part to the coded firing command from the controller 12); and 2) internal and external conditions (col. 16, ll. 17-33) are received from external sensor 18a and internal sensor 56, transferred to logic gates 54a,b which then compares the conditions to the firing signal. Recall that internal sensors can measure *voltages, frequencies and current draw* (col. 12, ll. 36-39).

In the embodiment of Fig. 5, unique identifiers are not disclosed as being used.

However, the embodiment of Fig. 1A discloses such a feature. Specifically, Fig. 1A

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discloses initiator devices that are programmed to respond "those signals that contain an address code identified with that initiator." (Col. 9, ll. 49-59). At the time of the invention, one having ordinary skill in the art would have found it obvious to provide the embodiment of Fig. 5 with the unique address features of Fig. 1A. The suggestion/motivation for doing so would have been to provide for the ability to address specific initiators and increase safety.

2. Claim 101 is rejected under 35 U.S.C. 103(a) as being unpatentable over Boucher in view of the embodiment of Fig. 1A and in further view of US 5894103 issued to Shann. Specifically, Boucher discloses the bus controller 12 for transmitting operational signals using a unique code; a plurality of pyrotechnic devices 16, 18, 20, 22 connected to network 14, the pyrotechnic device 16c comprising an initiator 42a and a logic device having a unique identifier. (Refer to the rejection of claim 91 for specifics).

In the embodiment of Fig. 5, unique identifiers are not disclosed as being used.

However, the embodiment of Fig. 1A discloses such a feature. Specifically, Fig. 1A discloses initiator devices that are programmed to respond "those signals that contain an address code identified with that initiator." (Col. 9, ll. 49-59). At the time of the invention, one having ordinary skill in the art would have found it obvious to provide the embodiment of Fig. 5 with the unique address features of Fig. 1A. The suggestion/motivation for doing so would have been to provide for the ability to address specific initiators and increase safety.

Boucher does not appear to disclose the disarming command that results in discharging stored activation energy. Shann discloses an abort command that can be

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issued to discharge energy stored in a capacitor when it is no longer desired to fire an ordnance device (col. 4, ll. 53-59). At the time of the invention, one having ordinary skill in the art would have found it obvious to provide the combined device of Boucher with the "abort" feature of Shann. The suggestion/motivation for doing so would have been to allow a person to disarm the device and cease the firing operation in the event of an emergency.

(10) Response to Argument

A. Claim 91

3. First, the rejection has been modified to delete US 4860653 issued to Abouv as a supporting reference. While the examiner suspected the signals in the Boucher reference to be digital, it was not expressly clear in the specification that this was the case. However, further analysis of the reference (including applicant's admission in the appeal brief) that the signals are in fact digital, has warranted removal of Abouv.

4. Second, applicant's admission regarding what was known about bus interfaces has been deleted as a supporting reference. Upon further review of Boucher it has been determined that the internal components of the initiator 16c (Fig. 5) include internal components such as internal sensor 56 that "interface" with the bus to analyze voltage, frequency, current draw, etc.

5. It should be noted that the applicant's description of the Boucher reference, while correct, is not applicable. On pages 13 and 14 of the Supplemental Appeal Brief received 10/06/2008, the applicant refers to the embodiment of Figure 3 in an attempt to overcome the examiner's rejections. The embodiment of Figure 3 describes a *time-*

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phased or *stepped* arming (charging) process. However, in the Final Rejection mailed 10/30/2007, the examiner specifically referred to the embodiment of Figure 5. In that embodiment, the Boucher describes an arming process in which a capacitor is charged once a single arming signal is received by a logic gate and conditions precedents are met. (Col. 15, line 65 to col. 16, line 7). The inventor goes on to say that the *time-phased* manner of arming, as described by the applicant, was an optional means of charging the capacitor. (Col. 16, ll. 7-9).

6. On page 14, last paragraph of the applicant's Brief, it is argued, "In other words, when the firing signal is received, the pyrotechnic device will attempt to initiate the initiation element, but if the capacitor has not been charged sufficiently, it will not work." Again, this argument and conclusion is based on an alternate embodiment of the Boucher invention. As discussed above, when the firing controller of the Boucher ordnance device issues a "fire" signal, the signal is compared to internal 56 and external sensors 18a by logic gates 54a and 54b. (Col. 16, ll. 15-33). Only when conditions are met will the logic gate permit the firing signal to be passed to the firing switch 58.

B. Claim 101

7. Applicant argues that while Shann teaches an abort signal, Shann does not teach an abort signal in combination with a unique identifier. As the applicant has admitted in the Brief, the examiner responded that the unique identifier is provided by Boucher. The examiner repeats that response. Referring to the rejection of claim 101, Boucher teaches every element with the exception of the limitation regarding discharging of stored activation energy upon receipt of a digital disarming command.

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The only means in which the controller 12 can communicate with the pyrotechnic devices 16, 18, 20 is by means of the address code discussed at column 9, ll. 46-59.

To provide a disarming feature, one of ordinary skill in the art would look to Shann and merely program Boucher with an "abort" command and provide the initiator with the necessary components so that the capacitor 26 can be properly discharged. Shann provides the teaching of how to accomplish this.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Troy Chambers/

Primary Examiner, Art Unit 3641

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